

SCIENCE

FRIDAY, JANUARY 11, 1889.

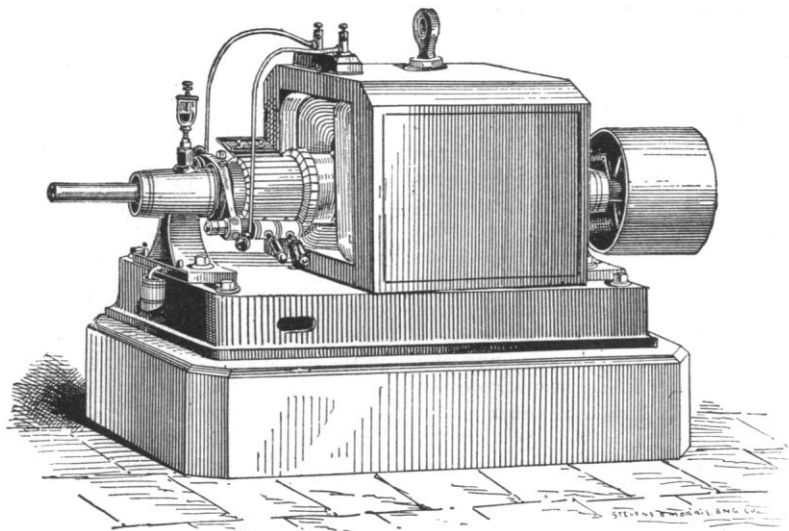
THE CONTINENTAL DYNAMO.

MANY of the most important improvements that have been made in the last few years in dynamo-construction have been in the direction of greater simplicity and solidity of design, me-

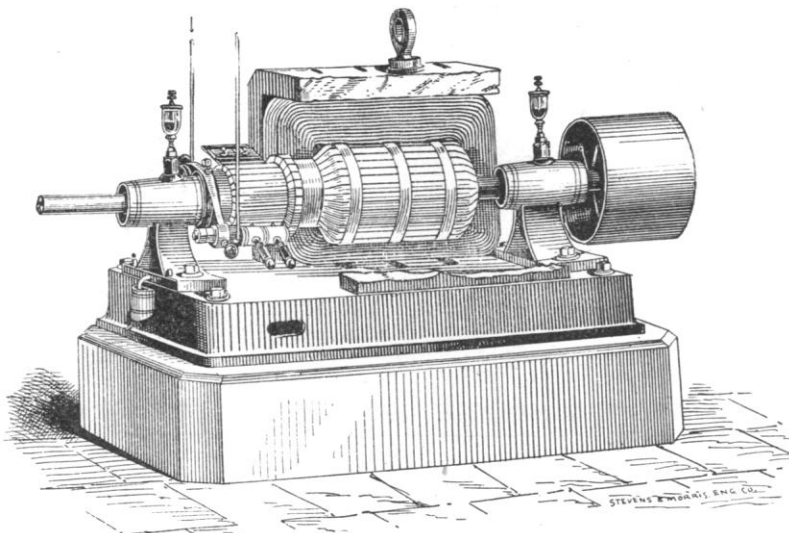
chanically and electrically, and in the better proportioning of the different parts. No radical changes or discoveries have been made; but, if we compare the dynamo of to-day with that of four or five years ago, we will find a greater efficiency, a much greater

output of current for the same weight of metal in the machine, and less expense for repair. But while no radical changes in principle have been made, yet some new types of dynamo have been introduced that present important peculiarities. The Continental dynamo, which we illustrate in this issue, seems to be as simple and compact as it is possible to make a dynamo. The pole-pieces and

casing are one casting, so that there are no joints in the magnetic circuit. The magnetic coils are wound separately, and are slipped over the pole-pieces. The great advantages of this type of machine lie in low resistance of the magnetic circuit, and in the fact that practically all of the lines of force pass through the armature, together with its compactness and stability. The magnet coils and armature are protected from injury by the outer casing; and



THE CONTINENTAL DYNAMO.



INTERIOR OF CONTINENTAL DYNAMO.

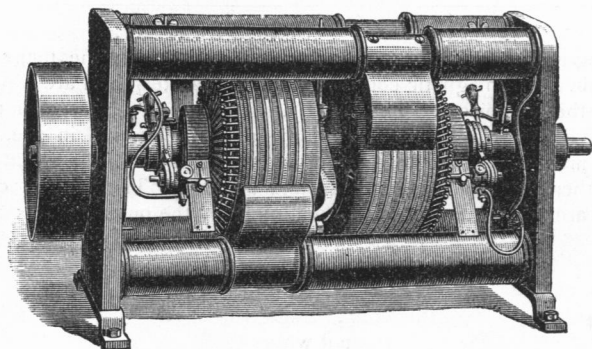
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neighborhood. The advantages of the dynamo seem to be in simplicity and solidity of construction, accessibility of different parts, no leakage of lines of force, and efficiency, while little care is necessary in attendance; and, as it is not high-priced, it is a machine that in general is likely to meet the demands of a wide circle of users.

BALL ELECTRIC-LIGHTING SYSTEM.

ONE of the most peculiar of the many dynamos that have been used or proposed for arc-lighting is that of the Ball Electric Company. From the accompanying illustration it will be seen that two armatures are mounted on the shaft, with one pole-piece for each.



THE BALL DYNAMO.

The armatures are of the well-known Gramme ring type, and are constructed with a large number of separate coils, thus reducing the sparking at the commutators to a minimum. By some it is claimed that the dynamo must be at a disadvantage from the considerable magnetic resistance that the lines of force experience in passing from pole-piece to pole-piece. By others it is said that this is not so, as the lines of force do not close their circuit from pole to pole, but from poles through armatures to magnet-bars opposite; and that from the thinness of the copper windings, and from there being two armature-cores in multiple across a common field, the magnetic resistance is actually less than in other makes

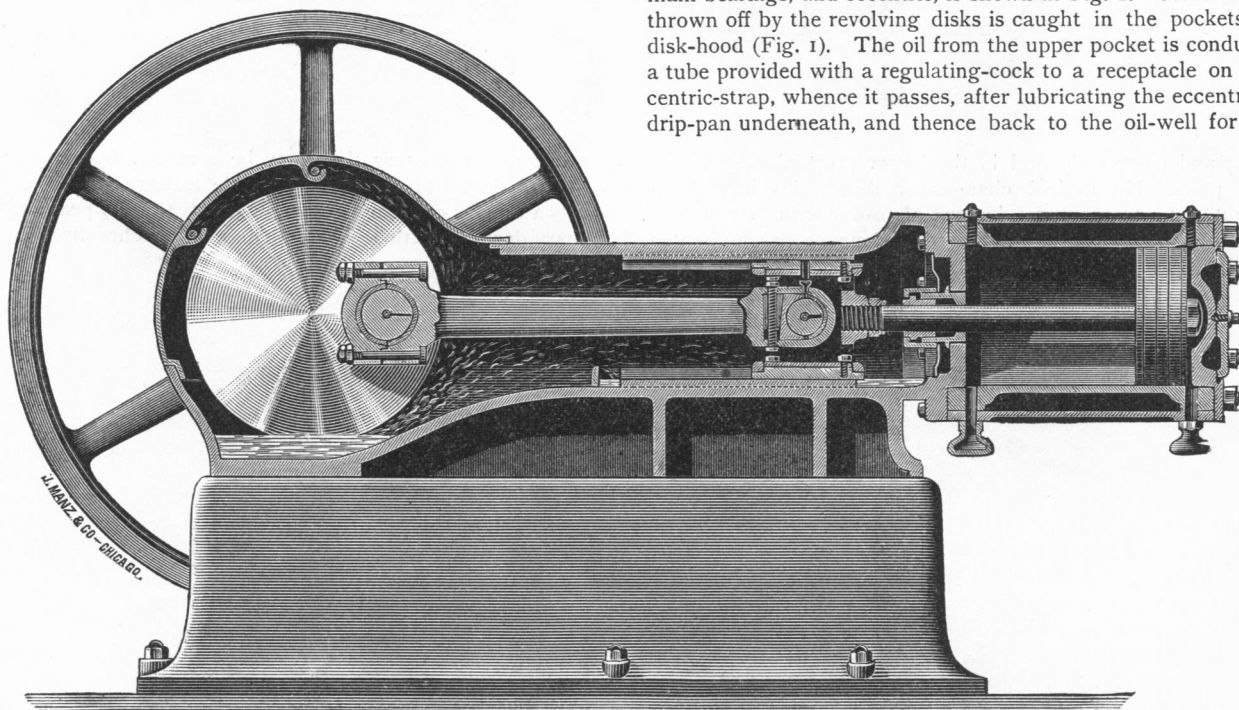


FIG. 1.

of dynamos. The large output of the dynamo in comparison to its weight, and the small amount of copper used upon its field, seem to testify to the correctness of the latter.

Its advantages, which are of a practical kind, lie in the fact that by distributing the rotating wire on two armatures the number of layers can be reduced, the difference of potential between adjacent turns is less, and therefore there is less liability to burn out, while the excellent ventilation prevents overheating; also, if any thing happens to one armature, the other can be used to run part of the lamps.

The mechanical construction of the dynamos is excellent, and, from the testimonials contained in the last circular issued by the company, it would seem that the machine can stand the maximum of rough usage with a minimum of repair.

Besides the high-power lamps of 2,000, 1,600, or 1,200 candle-power, the Ball Company advertise smaller arc-lamps of 800 candle-power, for use in stores, etc., and they also provide incandescent lamps to be used on arc-light circuits. They also furnish complete incandescent-light installations.

THE "IDEAL" STEAM-ENGINE.

AN improvement in one of the most important steps in the conversion of heat into power, showing the results of scientific methods applied to the design and construction of the steam-engine, is illustrated on this and the next page. This engine, which is known as the "Ideal," is a more highly developed form of the Ide engine, and is manufactured by A. L. Ide & Son of Springfield, Ill. It was designed to meet the special requirements of electric lighting, such as high speed, small space, perfect regulation, absence of vibration, and economy in the use of steam; and the results shown by actual use prove that the designers of the engine are progressing in the right direction. The engine is compact, perfectly balanced, and self-oiling; and, as it has a rigid double frame with heavy sub-base, it may be run at a high speed without vibration.

The manner of lubricating the guides, cross-head pin, and piston-rod, is shown in the longitudinal section, Fig. 1. The oil is taken up by the crank-pin disks, when in motion, and thrown by centrifugal force upon the guides and piston-rod. The oil wiped from the upper guide by the cross-head slide passes through a tube in the top slide, entering a funnel in the connecting-rod, and thoroughly lubricating the cross-head pin. The peculiar manner of keeping a constant supply of oil in contact with the crank-pin, main bearings, and eccentric, is shown at Fig. 2. Some of the oil thrown off by the revolving disks is caught in the pockets in the disk-hood (Fig. 1). The oil from the upper pocket is conducted by a tube provided with a regulating-cock to a receptacle on the eccentric-strap, whence it passes, after lubricating the eccentric, to a drip-pan underneath, and thence back to the oil-well for further

use. The oil from the other pocket flows through pipes into pockets cast upon the main bearings. From these points it flows into the grooves and channels connecting with the crank-pin, which is hollow. The centrifugal force carries it into the crank-pin, from which it escapes through holes into the bearing. Thus it will be seen that the main bearings receive constant lubrication, while the crank-pin receives a supply of oil from either side. This method of lubrication is constant, and provides for the most important bearings about the engine. Sufficient oil is placed in the basin under the crank-disks to cause it to flow in streams through both

pipes and in drops to the eccentric, but valves are provided on the pipes so that the supply can be regulated as desired; and the reservoir can be supplied with fresh oil while the engine is running. Besides the saving in oil, these devices keep a clean and presentable engine and engine-room.

The automatic cut-off governor is shown in Fig. 3. It is an isochronous governor, very simple in construction, and responds instantaneously to the slightest variation in load, cutting off the steam at a point that will just do the work and maintain the fixed speed of the engine. It is secured to the side of the fly-wheel, and connects direct through the eccentric on the main shaft with the valve, without the use of gearing, pulleys, shafts, or belts. All its parts are in sight, and are readily accessible for cleaning. It gives an open port at the beginning of each stroke, admitting steam to the piston at full boiler pressure, and varies the point of cut-off as the load requires, from the beginning to three-fourths of each stroke. The speed of the engine remains practically constant, regardless of the change of load or variation of steam-pressure in the boiler, the variation from no load to the full power of the engine being, it is claimed, less than one per cent. The

SCIENTIFIC NEWS IN WASHINGTON.

Does Exposure to the Sun cause the Human Skull to be Harder and Thicker? — Diseases of Menagerie Animals. — The Geological Survey.

Does Exposure to the Sun cause the Human Skull to be Harder and Thicker?

ONE of the most interesting things mentioned by Professor Virchow in his little book just published, entitled "Medical Remembrances of an Egyptian Journey," in which he describes an excursion up the Nile as far as the first cataract, is that the broken skulls on the first great sepulchral fields, dating from Roman times, are as thick and hard as Herodotus says those of the slain Egyptians were in comparison with the brittle ones of the Persians. The Greek historian explains this by attributing it to the early exposure of children to the heat of the sun; and in many parts of upper Egypt the German travellers actually found young children thus exposed during their parents' absence in the fields, in immense clay bowls, resembling in shape a champagne-glass with a stem, into which they were put without shelter.

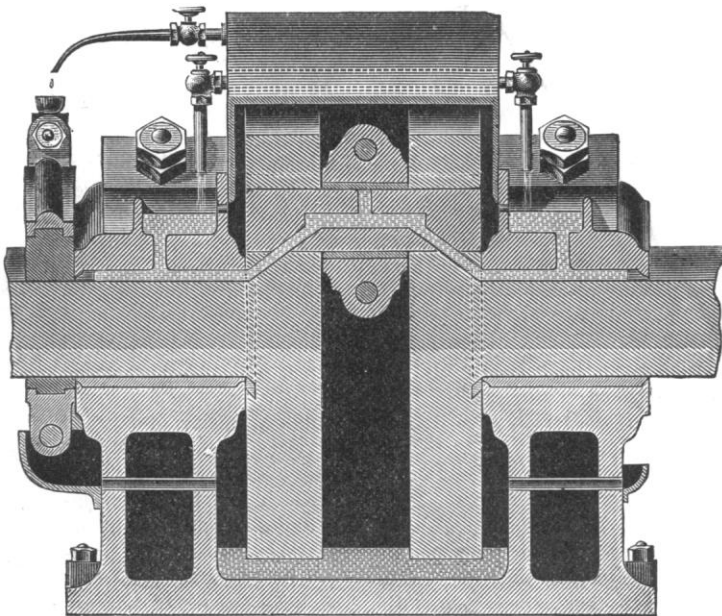


FIG. 2.

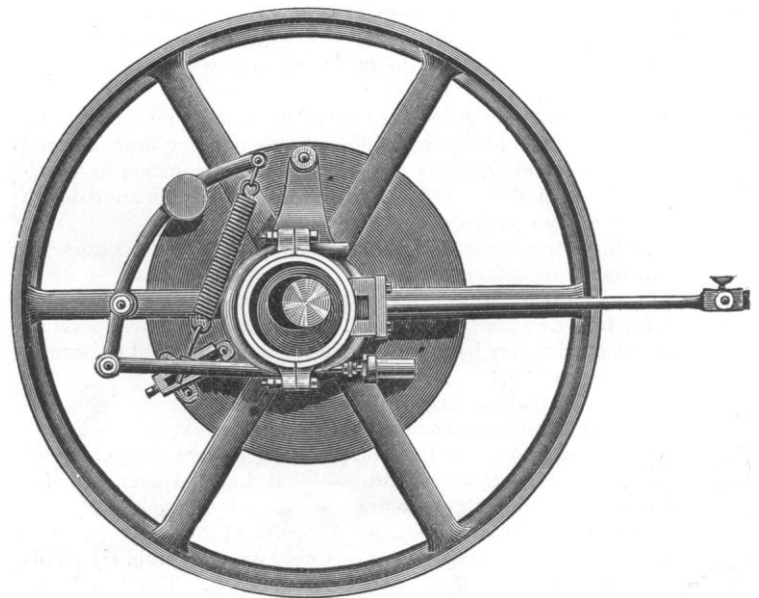


FIG. 3.

dash-pot attached to the eccentric prevents any sudden movement of the weight when a great change of load occurs suddenly. The running speed of the engine may be changed to suit requirements by shifting the position of the weight on the lever.

The steam-chest is bored out and fitted with a pair of cylinders or bushings which have supporting bars across the ports, to prevent any possibility of the valve catching upon the ports. The valve is of the hollow piston type, — a hollow tube, with a piston at each end. It is surrounded by steam, which presses equally upon each end, thus perfectly balancing the valve and relieving its pressure, insuring it long service with little wear. The piston-head is a single casting, hollow, and as light as is consistent with strength. The cross-head is a crucible steel casting, with phosphor-bronze slides; and the attachment to the connecting-rod is central, thus avoiding any strain on the piston-rod by angular thrust. The guides are bored out the same size as the cylinder, thus insuring large wearing surfaces and constant accuracy of line with cylinder. This, together with the self-oiling devices, insures cool running, and long service without adjustment. It may be added, that the construction seems to be such as to give the required strength and rigidity for high speeds; ample wearing surfaces are provided; all the parts are made of steel, phosphor-bronze, and charcoal iron, and are interchangeable; and every engine is tested by actual service at the factory.

This discovery by Professor Virchow is interesting, because it at once suggests the question whether the proverbial thickness of the skull of the negro has not been caused by exposure to the sun, and whether it is a peculiarity of savages of tropical countries that their skulls are thicker and harder than those of the inhabitants of temperate and colder countries.

Students of craniology have never made any investigation to ascertain whether the skulls of different races vary in degrees of hardness. It would be almost impossible to make such an inquiry. As is well known, the human skull increases in hardness from childhood to maturity and age. A miscellaneous collection of skulls of any given people would therefore be of no value in such an investigation. To obtain a collection of skulls of a number of nationalities, that should be taken from subjects all of the same age, to have them all similarly prepared and in sufficient numbers to make it possible to draw any general conclusions from their comparison with each other, would be manifestly impossible.

More attention has been given to the relative thickness of different skulls, or rather to their weight, from which their thickness may be inferred. Of the large collection of crania in the Army Medical Museum at Washington, the thickest are those of negroes and Alaskan Indians. The skulls of other Indians, both of North and South America, in tropical or temperate climes, and of the Eskimo, do not appear to be particularly thick. Among the ancient

Peruvian skulls recently received by the museum, and the ancient crania collected in Arizona last summer, there are frequent individual variations in thickness, but no tendency to unusual thickness. The conclusion from these facts is, that exposure to the sun probably does not cause thickness of the human skull.

In connection with this subject, it is interesting to note, that, among the Australians the *sinus frontalis* is generally found to be solid in the males, instead of being hollow as in the skulls of other races. This bone in the male Australians generally extends straight across the head, the lower side overhanging the eyes so that they seem to look out from under it, while in the North American Indians a modification of shape deprives them of that heavy look about the forehead. The heavy *sinus frontalis* of the Australians, of course, increases the weight of the skull.

Diseases of Menagerie Animals.

At the meeting of the Biological Society, Mr. F. A. Lucas read a paper on "The Diseases of Menagerie Animals." He showed that menagerie animals are extremely liable to disease; and this is almost as true of those born in captivity as of those which are captured when full grown.

Young animals suffer greatly from caries, owing to lack of proper diet, and their bones are very generally soft, swollen, and misshapen. The maxillaries are especially liable to be attacked during the period of teething, and the facial region is in consequence very much distorted.

Diseases of the lungs are very prevalent among menagerie animals, tuberculosis being exceedingly common among monkeys, and found among other animals less frequently. Pneumonia is a frequent cause of death, and birds as well as mammals are liable to be attacked by this disease.

The following is a list of animals examined, where the cause of death was fairly established:—

Macaque (*Macacus cynomolgus*).—Tuberculosis.

Gray fox (*Urocyon virginianus*).—Pneumonia. This specimen also exhibited a very bad case of intestinal catarrh and inflammation of the bladder.

Badger (*Taxidea americana*).—Pneumonia.

Elephant (*Elephas africanus*).—Pneumonia.

Lynx (*Lynx rufus*).—Uræmic poisoning (in two cases).

Black bear (*Ursus americanus*).—Killed. Had been sick for some time with catarrh of stomach and intestine.

Mino bird (*Eulabes affinis*).—Congestion of lungs.

Parrot (*Amazona ochroptera*).—Congestion of brain (?) This bird died suddenly, and all organs were healthy. The blood-vessels of the brain were much congested.

Parrot (*Amazona Levaillantii*).—Tuberculosis.

Tooth-billed pigeon (*Didunculus strigirostris*).—Disease of liver, that organ being converted into a hard, waxy mass adherent to sternum.

Pigeon (*Columba livia domestica*).—Disease of liver, same as above.

Eagle (*Haliaeetus leucocephalus*).—Fatty degeneration of liver.

Night heron (*Nyctherodius violacens*).—Congestion of lungs.

The Geological Survey.

Appropriate committees of the Senate and House are considering, with very favorable tendencies, the bill appropriating \$600,000 for the erection of a building for the Geological Survey, on the public reservation near the Smithsonian, where grounds have been allotted to it. The plan submitted by Major Powell contemplates a solid and compact rectangular structure, covering 100 by 300 feet, five stories high, with hipped roof. It will be of Seneca sandstone (like the Smithsonian), or of selected red brick with sandstone buttresses, trimmings, and belt courses, and overground basement of same. The general arrangement will consist of a series of large, well-lighted rooms, averaging 16 by 24 feet, disposed about a spacious central court lighted from the top, and with tessellated floor. In this court the working collections of the survey will be open to inspection. The preliminary ground plans and elevations have been prepared by Messrs. Victor Mindeleff and Delancey W. Gill of the Geological Survey.

THE TASK OF STATE WEATHER SERVICES.

PROFESSOR FRANCIS E. NIPHER, in an interesting pamphlet on the rainfall of Missouri, takes occasion to urge the establishment of State weather services. "The State weather service," he says, "bears the same relation to the national service that the State Government bears to the National Government."

"There are many large storms, of great severity, which damage shipping and endanger life. The Signal Service has done a great work in giving warning of these storms. Shippers and dealers in provisions and fruits find the cold-wave warnings of the greatest value. In all large cities the approach of a 'warm spell' is known through the Signal Service predictions, and thousands of tons of meats are hurried to cold storage warehouses, and the opportunity to ship other provisions which must be kept from freezing is anticipated and made available. It is not saying too much to say that it would be impossible to carry on the shipping business of the country as it is now carried on, without the aid of the national weather service."

"But each State has its own peculiar industries, advantages, and interests. It should provide for a thorough study of its own climate, and should distribute published reports for the benefit of those who may desire such knowledge."

"There is another field which peculiarly belongs to the State weather service. The weather which is of greatest importance to the farmer is the weather of harvest. During that time storms are usually very local. They may cover a few counties only, and inflict immense damage. People living in the city can learn from the Signal Service that there will be 'local rains in Missouri,' but nobody knows where in Missouri they are going to locate; and even this information reaches the farmer only after the rain is over, if at all."

"The local peculiarities of these storms require study in each State. Very much has been done in this direction in Iowa and by the New England Meteorological Society. Such work should be at once begun in our State. In three or four years we should be familiar with the behavior of these storms, and this knowledge could be given to all."

"In 1893 the telephone will become public property, and it will then be possible for county telephone services to be established, putting each farm in communication with a county seat. Telephone service can be rendered for a sum which will be utterly insignificant when compared with the advantages which it will bring. Farmers can then keep informed of the markets, can sell their produce before leaving their homes, and will be able to save much time which they now waste during the busy season of harvest. This is all so apparent that it is needless to discuss it further. In addition, there will grow up a system of harvest storm warnings. It will be very easy for any county telephone system to give its subscribers a general warning of an approaching thunder-storm, and to transmit that information to such other counties as may be in danger. The exact details of this scheme may be left to the director of a State weather service to work out. It seems certain that this can and will be done, and there is no reason that this should be done by the national weather service."

COMMERCIAL GEOGRAPHY.

The Development of Commerce on the Kongo.

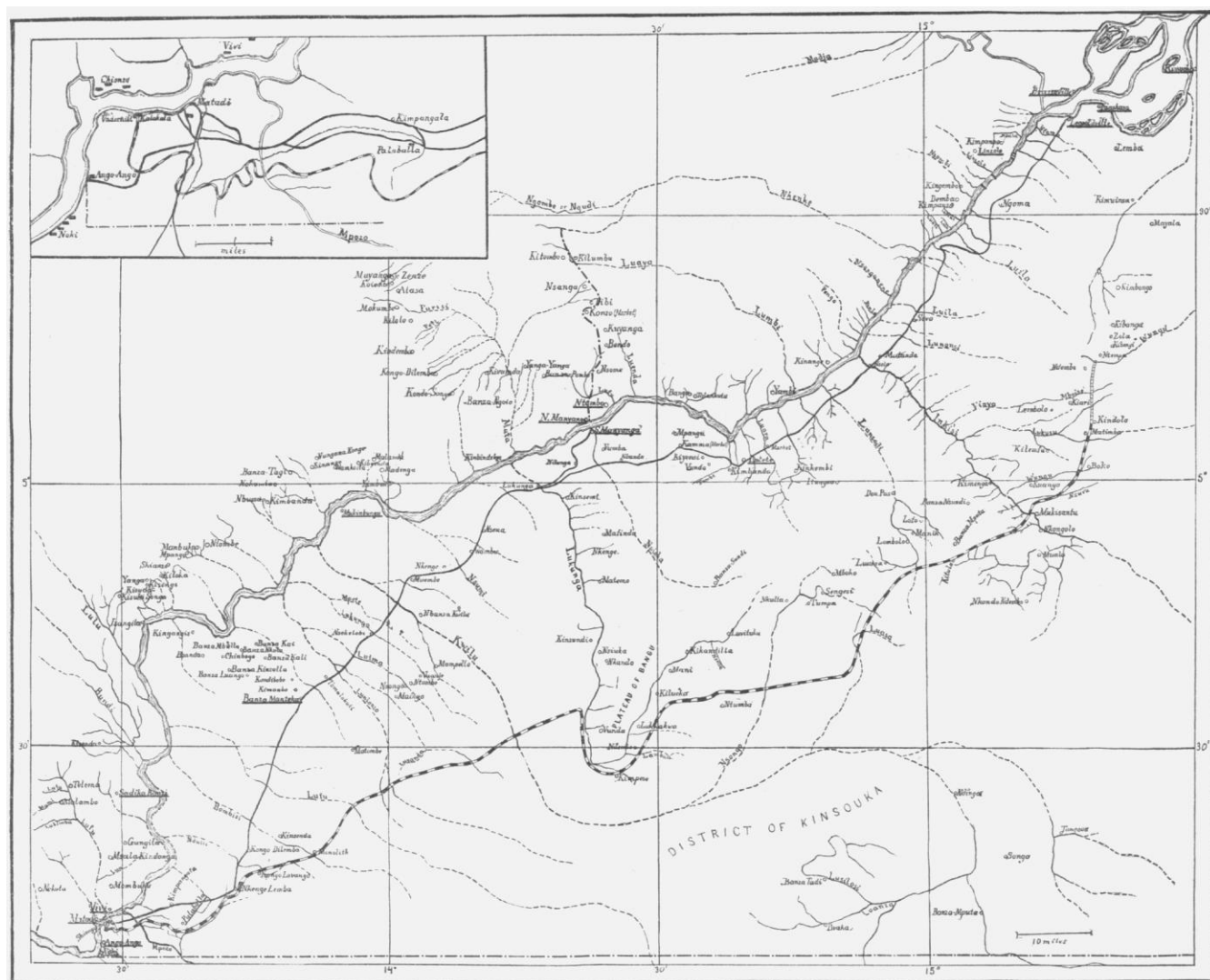
THE Belgian Compagnie du Congo pour le Commerce et l'Industrie is pushing on its enterprises vigorously. The most important among these for the development of the resources of Central Africa is the railroad from Matadi to Stanley Pool, connecting the navigable upper Kongo with the highest point that can be reached by steamers. In the past year a corps of engineers was engaged in surveying this line, which offers peculiar difficulties on account of the deep gullies cutting the line to be followed by the road at right angles. At a recent meeting of the shareholders of the company, M. Cambier, chief engineer of the expedition, gave a report of his proceedings, which has been published in a recent number of the *Mouvement Géographique* from which we take the following statements and the accompanying map.

It will be noticed, that while the old caravan route runs approxi-

mately parallel to the Kongo, and crosses its affluents near their mouths, the railroad either crosses these rivers near their sources or keeps on the divides between these river systems. Thus the deep gullies and valleys are avoided, gentle slopes prevailing on the plateau. Considerable difficulty was encountered in climbing this highland which falls abruptly to the river. It was found impossible to ascend it by one of the tributaries of the Kongo coming from the south, as they run in inaccessible gorges. But fortunately a depression was found a short distance below Matadi, from which point the projected road ascends the highland. The road will cross the tributary Mpozo on a bridge, and, after having avoided the plateau of Palababa by a *détour* to the south, it takes an east-

about 300 feet above the Kongo, which are traversed through narrow and tortuous valleys. Later surveys show that a better line may be found farther to the west. Although it will be some time before work on this line is taken up, the results of these surveys show that it may be constructed without incurring extraordinary expense. Preliminarily the establishment of a regular connection with the upper Kongo by means of oxen is contemplated.

The commercial reconnaissance of the upper Kongo region, and the tentative establishment of stations by the Belgian Company as well as by the Sandford Exploring Expedition, have encouraged the promoters of these enterprises to take more energetic action. The two companies have recently joined, and formed the Compagnie



PROJECTED RAILROAD FROM MATADI TO STANLEY POOL, KONGO FREE STATE.

north-easterly direction, until the river Lukunga is met. It seemed at first that some difficulties would be encountered here; but the reconnaissances of the engineers showed that the valley of the river takes a north-easterly turn, and thus they were enabled to follow its left bank without crossing it. No serious obstacles are encountered between the bend of the Lukunga and the Inkissi, the country consisting of hills intersected by small ravines. Between the line and the Kongo rises the plateau of Ngombi to an altitude of 1,600 feet. This part of the country is intersected by deep valleys. The Inkissi, at the point where the railroad is proposed to cross it, is about 350 feet in width. A number of rocks are found in its bed, which will facilitate the construction of a bridge.

East of the Inkissi the population becomes less numerous, and the country is more elevated and sandy. The heights of the hills are clad in forests, and deep ravines intersect the slopes of the plateaus. Approaching Stanley Pool, the line has to pass over hills

Belge du Commerce au Congo, with a capital of 1,200,000 francs, which has for its purpose the establishment of regular commerce with the Kongo basin.

HEALTH MATTERS.

The Schoolroom as a Factor in Disease.

A VERY valuable paper on "The Schoolroom as a Factor in the Production of Disease" was read by Dr. J. A. Larrabee of Louisville, Ky., at the last meeting of the American Medical Association, and is reported in full in the *Journal*. Estimating that one-third the lifetime of every educated person is passed in the schoolroom, it follows that the location, construction, and surroundings of the same are matters of importance. While there has been great advance in these respects, much still remains to be done. In Switzerland the summits of small hills are selected as school-sites.

Schoolhouses should be built in parks, and every thing possible done to make them attractive both outside and within. Ventilation is a matter of prime importance. Among the diseases caused or favored by schools, he places the following: contagious diseases, headaches, eye affections, chorea, and consumption.

This paper was discussed by several of the members of the association. Dr. Lindsley of Tennessee said that there were two points which he wished to emphasize: 1. Medical men must arouse public attention to the necessity for paid medical inspectors. 2. No text-books of hygiene should be put in the schools, because the masses do not get this education. The majority of children leave the schools before reaching the higher classes where this subject is taught. Hygiene should be impressed upon them by every feature of their environment.

Dr. Hibberd of Indiana agreed with Dr. Lindsley in the utter impossibility of teaching children in primary schools enough physiology to be of utility. There are many who are grandfathers who do not know what it is absolutely necessary to teach. Teach youth to observe, and what things they should observe. The trustees of schools understand the necessity for air, light, etc., but they cannot get the money to provide them. Every schoolhouse in the land should be situated so as to face the best direction of the compass, having air and light in abundance; but it will cost a great deal of money.

We must recognize that all children are not exactly alike in their capacity for receiving education; and the present methods are faulty in teaching all children on the same plan. Due regard must be paid to mental and physical variations, and sound minds and bodies cannot be had until this is recognized.

Dr. Hamilton, United States Marine Hospital Service, said that the reason that the majority of German children were myopic was due to the employment of the old black letter. German medical text-books are printed in Roman letters, but for political reasons the black letters are generally used. He believed in the necessity for school-inspectors; and the first thing they should do would be to examine the text-books, the paper of which is often inferior, and the printing but little better. Another feature demanding improvement is the sitting arrangement of a schoolroom. All know the country schoolroom, with its four rows of desks, and windows on either side of the room, which imperfectly light the middle rows of desks.

Dr. Vaughan of Michigan did not believe that all defects in eyesight in school-children are attributable to the schoolroom. If one enters any family room at night, the father and mother will be found sitting on either side of a table on which the light is, and the children are allowed to sit anywhere. More harm is done young girls by sitting up late at night at parties and dances than by all the alleged confinement in the schoolroom. Dr. Larrabee did not refer to the stairs, which are usually selected as one of the fertile sources of disease in young girls; but if one watches a woman go upstairs, she does it with her body bent forward, and swinging from side to side, instead of going upstairs erect. The German method of the climbing cure might be employed advantageously in some of these cases. In Michigan most children are better situated at the schoolhouse than at home; farmhouses, as a rule, from a sanitary point of view, being far from good. The ignorance of teachers on hygienic matters seems to me to be the primary evil.

Dr. Hibberd believed, with Dr. Vaughan, that the fundamental education should be with the teacher. But the architect must also be remembered. This gentleman usually puts his efforts on the adornment of the exterior of the building, and the interior is suited to this. One cannot get architects to give sufficient attention to the interior of these buildings, because it is their aim to produce handsome work.

Dr. Vaughan stated that the plans for school-buildings in Michigan must be approved by the State Board of Health.

ELECTRIC LIGHT AND EYES.—In the *Medical News*, Dr. George M. Gould discusses the question, "Is the electric light injurious to the eyes?" Before proceeding to the direct answer of this question, he refers to the relation of the electric light to general hygiene. Most every one, he says, has a general impression that the electric light is much superior to other methods of artificial illumination, so far as concerns our general health and comfort, but

few could give a reason for the faith that is in them. They will come out of a theatre, music-hall, church, etc., with headaches, lassitude, exhaustion, their bodies bathed in sweat, all resulting in colds and a multitude of major and minor affections, and never utter a word of protest or complaint against the culpable and parsimonious management that permits the vitiation, poisoning, and superheating of the atmosphere by a thousand gas-jets. In the discussion of the question as to the injury to the eyes by the use of the electric light, Dr. Gould refers at length to the literature of the subject, and sums up the whole matter in the following conclusions: 1. As regards general hygiene, the superiority of the electric light over gas as an artificial illuminant is so overwhelming as to admit of no discussion. It is incontestably the light of the future, and the public should not rest until its meeting-places, such as theatres, halls, reading-rooms, churches, etc., are lighted by the most perfect system at its command. 2. A study of the published cases of injury of the eyes by the electric light shows that not one was due to the use of the diffused light as an illuminant. The popular prejudice against such a use of it is absolutely without justification. All the cases reported were of scientific investigators, etc., or workmen about the light, who approached it very closely, gazed at it protractedly, and without protecting colored spectacles. 3. The ocular injury is due, not to the supposed preponderance in the electric-light rays of violet and ultra-violet (chemical or actinic) waves, but simply to the greater number (intensity) of the usual length light-waves. 4. The symptoms of the ocular injury are possibly immediate temporary "retinal paralysis," blepharospasm, central scotomata, chromatopsia, after-images, etc. Within twenty-four hours there come on intense photophobia, lachrymation, ocular pain, a feeling as of foreign bodies beneath the lids, conjunctival hyperæmia and congestion, pericorneal circles, etc. 5. The attack usually lasts but two or three days; the prognosis is excellent; the treatment is simply cocaine and atropine instillations and cold or hot compresses. 6. Workmen and experimenters who must approach closely to the electric light should protect their eyes by smoked or tinted glasses, the depth of the tint being greater where the light is more brilliant, the proximity greater, or the exposure longer. In the welding-works the workmen must be particularly careful about this, and must also not expose the skin of the face, neck, and hands to the action of the light. The precaution may not be amiss to advise the curious against testing their eyes by gazing at the ordinary arc and glow lights at short range.

ELECTRICAL NEWS.

The Electric Sugar-Refining Process.

IN the last week the daily press, and the stockholders of the company organized to develop the electrical refining of sugar, have learned that the process does not exist, and that a gigantic fraud has been perpetrated. It is just to remark that many of the electro-technical papers have denounced the scheme from the first. With the Keely motor, it demonstrates the fact, that, by making large enough promises, a clever adventurer can get a great many people to advance money to promote the most impossible plans. There are few people who will not risk a few hundreds, or even thousands, on the promise of making a million in a short time. The refining process in question was secret from the first. Elaborate precautions were taken to avoid publicity, — a fact that should have at once aroused the suspicion of investors. A large sum of money (\$250,000 to \$350,000) was given the alleged inventor for the purpose of equipping a factory; and a few bags of raw sugar, taken to the works and submitted to the process, apparently came out as refined sugar. In reality this was effected in an extremely simple manner, by substituting previously provided refined sugar for the raw in the secret "electrical" chambers. The whole matter illustrates forcibly what we recently said about electrical investments, that while there are such investments which will give better returns than in almost any other industry, yet, like any thing else that is new and not well understood, it has been and still is the means by which a great deal of money has been obtained from trusting investors, from which there will never be any return.

THE ELECTRIC LIGHT IN LAND WARFARE.—The London *Electrician* describes the following experiments made on Hamp-

stead Heath, for the purpose of testing the capacity of small electric hand-lamps in searching for the wounded men left after a battle, and thus more rapidly than hitherto bringing the sufferers within the reach of surgical aid. The experiments were made by the officers and men of the London Division of the Volunteer Medical Staff Corps, — an organization which already consists of four efficient companies, largely composed of medical students, and for which a fifth company is now in process of formation. The corps, under Surgeon-Commander Norton, accompanied by ambulance-wagons, and provided with stretchers, halted upon one of the Heath roads at a time when the thick mists still hung heavily upon the lower grounds, and having established a field-hospital in a rather dreary-looking spot, poorly sheltered by bare trees, sent out its searching stretcher parties to pick up the bandsmen who had been distributed over the open ground at some distance off, to simulate the wounded left from a fight during the daylight. By the aid of the lamps thus brought into use for the first time, the men sought were found with comparative rapidity, the lights being sufficient also to enable the trained ambulance-men to apply preliminary bandaging upon the spot, and before loading the stretchers, which by other lights at the wagons were guided back to the road. There the men were carefully placed in the vehicles, and conveyed to the field-hospital, where the examining surgeons found very little to correct in the treatment adopted under such disadvantageous circumstances. The results achieved indicate sufficiently well, says the *Daily News*, that the electric light thus used would be of immense value, and tend greatly to reduce the suffering of men left upon the field at the close of a fight.

AN ELECTRIC ROAD FOR CHATTANOOGA. — There has been a very rapid extension of electric street-railroads during the year in all but the Southern States. Here only one very important road has been completed, although several are under contract. The street-car system of Richmond has been equipped with electric motors, and recently the Thomsom-Houston Company has opened a short road in Danville. The most important contract in the Southern States since the Richmond road was finished is that recently given by the Chattanooga Street Railway Company to the Sprague Motor Company. The line will be five miles long, and there are on it a number of sharp curves and heavy grades, the maximum being about eight per cent. The road will be newly constructed throughout. Eventually the entire railroad system of Chattanooga will be equipped with electric cars. The present road will have overhead conductors, a small wire fed from a larger wire, — the former over the track, the latter anywhere that is most convenient. The motor-cars will be of the new Sprague type, lately described in this journal.

THE EDISON LAMP PATENTS IN ENGLAND. — There will soon be given a very important decision on Edison's patents for incandescent electric lamps. In this country there has been no direct decision as to the validity of Edison's patents, all of the suits heretofore having been of a preliminary character; but in England and Germany several suits for infringement have been brought by the companies controlling Edison's patents in those countries, and the decisions, with one exception, have been in their favor. It is an appeal from this adverse decision that has just been argued. In the case, Edison's patent was declared invalid mainly because of incomplete specification, Justice Kay holding that a lamp as made by Edison's description was not commercially successful, nor could it be made so. Witnesses on the two sides attempted to make lamps according to the specifications; and those called by the Edison Company succeeded in doing so, while those on the other side uniformly failed. Finally Professor Stokes was appointed as referee, and a number of lamps were made and were tested. Some of these gave out in a few hours, others burned longer. The results obtained would not be in any way satisfactory as compared with our present lamps, nor could a station using these first lamps be run at a cost to make such an enterprise practicable. Professor Stokes reported impartially the result of the experiments, which at the time were generally considered as favoring the Edison patents. Justice Kay decided, however, that the lamps described in the specification never became, nor could ever become, a commercial success. The case on appeal is now before the same court that formerly affirmed

the validity of the patents, and there seem to be strong hopes among those interested that the present decision will be like the former one. The decision of Justice Kay had a beneficial effect on the lamp-trade in England: prices have been reduced, and several firms have put new and improved lamps on the market. At the same time, if Edison is the original inventor of incandescent-lamp filaments, he should be entitled to the benefits of his invention. While the sustaining of a fundamental patent in any industry has a tendency to create a monopoly for a number of years, and restrict competition and decrease the rapidity of progress, yet the ill effect of a failure to sustain a just patent would have the still worse effect of discouraging invention. In the case of Justice Kay's decision on the Edison patents, the fact that the lamps made would not pay to manufacture commercially should have no weight, provided they first embodied the principle on which the present lamps are made; the only changes being in the improved methods and materials taught by experience, these improvements being merely in matters of detail.

THE DAFT MOTOR ON THE ELEVATED ROADS. — The Daft Electric Company continue their experiments with the large motor and trains of cars on the Ninth Avenue Elevated Railway in this city. Some weeks ago a train of eight cars was taken up a grade of nearly two per cent at a speed of seven miles and a half an hour. On several occasions a speed of thirty miles an hour, with three cars, has been reached. The regular train speed on the Ninth Avenue road is thirteen miles an hour, but with the electric motor no difficulty is found in maintaining a speed of fifteen miles an hour. A *Science* representative was one of a party, a few evenings ago, who were carried over the road from Fourteenth to Fiftieth Street at a speed approaching twenty miles an hour. The motion was smooth and easy, and there was nothing but the entire absence of smoke, smell, and cinders to indicate that the train was not drawn by an ordinary locomotive.

NOTES AND NEWS.

WE wish again to call attention to the monument for Audubon which it is proposed to erect over the place where he is buried. The authorities of Trinity Cemetery have changed the plot, and placed the remains in a well-constructed vault in one of the most conspicuous parts of the cemetery, and the committee in charge of the matter are anxious to have the monument erected as soon as the funds will justify it. Subscriptions are coming in very slowly. The committee have decided to distribute to each subscriber to the funds a copy of a portrait of Audubon which was painted by Cruikshank and engraved by Turnure. As this engraving is a copy of a very valuable and rare one, the committee hope that this will be an inducement to persons to subscribe.



— The American Society of Naturalists held in Baltimore, Dec. 27 and 28, one of its largest and most successful meetings. Methods of instructing large classes in botany were presented by Professors Goodale and Wilson, and in geology by Professors Niles and Williams. The society fully approved the excellent work of its committee on education, in paving the way for better instruction in the natural sciences in all grades of schools, especially the lower ones. Mr. J. E. Wolff showed a photographic method of class illustration, and Professor W. M. Davis explained a most interesting series of paper models, illustrating the development of certain topographic forms and their relation to base-levels of erosion. The society is composed largely of teachers, and desires to so arrange its meeting next year that the members may be able to attend the meetings of specialists held about the same time.

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A NUMBER OF REPORTS have been received which dispel the apprehensions in regard to the safety of Emin Pacha. When Osman Digma's letter arrived, announcing the capture of the Equatorial Province, this news did not seem unlikely, as it was known that the Mahdi had sent a large expedition up the Nile to attack Emin; but, as the news came at the moment when Osman expected an attack of the English, it appeared not improbable that the alleged news might be a trap to prevent the English from taking the offensive. A few days ago a Greek trader was reported to have arrived from Khartum with the news that the Mahdi's troops had failed to defeat Emin, and additional favorable news is said to have reached Cairo. It seems that ere long the mystery shrouding the events that have taken place in the region of the upper Nile since November, 1887, will be cleared up.

THOSE WHO CRITICISE the weather forecasts of the Signal Service, and at the same time would like to see discontinued meteorological work which does not directly bear upon practical questions, ought to read carefully the following remarks of Professor Cleveland Abbe, which are found in the preface to his "Treatise on Meteorological Apparatus and Methods:" "Meteorology can only be worthy of a place among the exact sciences in proportion to the improvements in its methods of observation, and to the extent to

which they cover the field of the phenomena. Thus the comparison between theory and observation requires the amount of solar radiation to be known to within 1 per cent, whereas it is at present uncertain by 15 per cent; it requires the temperature of the air to be known within 0.5° F., whereas published observations are not always reliable to within one or two degrees; it requires the general movement of the air to be known, whereas we have only very uncertain records of the stratum below 100 feet, nothing of the stratum between 100 and 3,000 feet, and scanty record of the cloud-stratum between 3,000 and 30,000 feet. Every effort to explain the ordinary phenomena of storms is embarrassed by the fact that assumptions as to the temperature, moisture, and wind have to be made because of the absence of actual observations. Weather-prediction will undoubtedly be more satisfactory when the present round of observations is enlarged so as to include the condition and movement of the great mass of air above us, while at the same time increasing the accuracy of measuring the lowest stratum."

THE COMMITTEE of the American Philosophical Society appointed to consider an international language continues its work. In a supplementary report made last month, the new attempts at forming an artificial international language are criticised, primarily Professor Melville Bell's "World-English." If the report characterizes this attempt as "English written on a new phonetic system," this view seems to be founded on a misunderstanding of Professor Bell's principle, which advocates a simplification of the English grammar somewhat in the sense of the opinions expressed in the first report of the committee. The greater portion of the supplementary report is taken up by restrictions upon the criticisms of Alexander J. Ellis of the Philological Society of London, who advocates the adoption of Volapük. It appears that a considerable number of scientists support the scheme of the American Philosophical Society, — to convene a congress for establishing the principles of such a language, — and that most of them concur in the view that it must have those characteristic features toward which Aryan speech is tending. An artificial language of such kind, if generally adopted, would undoubtedly be of great benefit to scientists, and make many publications, such as Hungarian, Bohemian, Roumanian, etc., available. But there seems little hope that in this period of nationalism the majority of scientists will forego the claim that their language is the language of the most accomplished and most cultured people of the world, and that it has a right to become one of the "world-languages." When this period has passed, English, French, and German will continue to be better means of international intercourse than any artificial language, which is necessarily a dead language, could be.

BOOK-REVIEWS.

The American Commonwealth. By JAMES BRYCE, M.P. London and New York, Macmillan. 2 vols. 12°. \$6.

THIS is pre-eminently the book of the season. It has been so long looked for, and so eagerly anticipated, that it will now be even more eagerly read. Dedicated to two such eminent publicists as Albert Venn Dicey and Thomas Erskine Holland, it is, first of all, a publicist's book; but the style is so clear, and the arrangement so logical, that it can and will be read by thousands of persons in this country whose better instincts stimulate them to improve the quality of their citizenship by studying a careful and impartial account of their national institutions. Professor Bryce's equipment for writing the book is of the highest order, and is not rivalled either in Europe or in this country. As a member of Parliament for Aberdeen and a member of the recent Liberal Ministry, as professor of civil law in the University of Oxford, as a careful and conscientious student of history, and as an accurate and painstaking man of affairs, whose knowledge of America is extraordinarily full and accurate, Professor Bryce combines in himself both the knowledge and the temper necessary to write a treatise on Ameri-

can institutions; and he has written one which will rank for years to come as the most thoroughgoing examination of them.

Professor Bryce's book will naturally be compared with the work of De Tocqueville, and it merits such comparison; yet it is in some respects a greater book than that of the French student of our public life. If De Tocqueville made a philosophical examination of American institutions, Professor Bryce has made a scientific dissection of them. He enters into detail elaborately and accurately. He illustrates fully and freely. He rarely speculates. The book falls into three divisions, corresponding to the volumes as issued in the English edition. The first deals with our National Government; the second, with our State governments; and the third, with what, for want of a better term, we may call our politico-social institutions. Under the latter head are included the party system, public opinion, the bar and the bench, railroads, universities, and allied topics. The book is too large to be condensed, and too detailed to be described within the limits of a review: it must be read to be understood and appreciated, and it should be read by all classes of our intelligent citizens. It will serve to clarify the ideas of many people as to what our institutions really are, and how they work. It will make plain for the first time, to thousands of citizens who consider themselves intelligent, how public opinion is formed — or, rather, grows — in this country, how it finds expression, and how it rules. It will suggest to the careless democratic enthusiast certain points of weakness in our institutions, and certain dangers which we must sedulously strive to avoid.

Professor Bryce is unquestionably a democrat both by nature and by conviction, and an ardent admirer of democracy. This is perhaps the reason why some of the English critics have not been able to fully appreciate his work. It is the reason, also, which will serve to increase its popularity among our own people. It has been criticised abroad as too large, too diffuse, repetitious. It may be all of these; but these are merely defects of form, which the excellence of the matter more than counterbalances. That Professor Bryce's book will be widely read goes without saying. We can only add an expression of the hope that it may be intelligently read and pondered over; for it is a book that is meant to do good, and which will do good if it is read in the spirit in which it is written. We owe Professor Bryce a debt of gratitude for the time, the labor, and the patience that he has bestowed upon our national life. That his work will make us better known and better understood abroad, and better known and better understood by ourselves, is, we believe, a necessary result of its publication.

Aspects of Education. By OSCAR BROWNING, M.A. New York, Industr. Educ. Assoc. 16°.

The Slöjd in the Service of the School. By OTTO SALOMON. New York, Industr. Educ. Assoc. 16°.

Manual Training in Elementary Schools for Boys. Part. I. By A. SLUYS. New York, Industr. Educ. Assoc. 16°.

THESE are the three latest issues in the admirable series of educational monographs published by the Industrial Education Association of New York City, the growing circulation and general appreciation of which mark a gratifying public interest in matters pertaining to education. Mr. Browning's paper on "Aspects of Education" is known to readers of *Science*, inasmuch as its four chapters appeared in these columns some months ago. They are now rewritten and put together in a connected paper. As trenchant and accurate summaries of the movements apparent in modern educational thought, Mr. Browning's articles are not surpassed anywhere, and we are glad to find them reproduced in this permanent form.

Mr. Salomon, the author of the paper on "Slöjd," is well known as the director of the famous normal school at Nääs in Sweden. As the chief master of slöjd (sloyd), he is fully competent to treat it in its philosophic and pedagogic relations, as is done in the book before us. The translation by Dr. W. H. Carpenter of Columbia College is pleasantly done.

The third paper, by Professor Sluys of Brussels, is the most valuable and important yet issued, and we notice that Part II. of it will follow in March. Professor Sluys was the Belgian commissioner to

investigate and report on manual training, and his paper is full of citations of facts actually seen and known. The book is free from speculation, and is practical, complete, and unanswerable. We trust that it may fall under the eyes of such men as Superintendents Dickinson of Massachusetts, Marble of Worcester, White of Cincinnati, Gove of Denver, and Dr. Harris of Concord; for it will show them, impartially and dispassionately, how crude and unscientific their thinking on the subject of manual training is. We shall await the appearance of Part II. with interest.

The Roman Catholic Church and the School Question. By EDWIN D. MEAD. Boston, G. H. Ellis. 12°. 15 cents.

THE substance of this pamphlet consists of a lecture delivered before the Woman Suffrage League, Boston, but it has been expanded and revised for publication. It is a discussion of the question raised in Boston by the rejection, by the school committee, of Swinton's "History" as a text-book, the ground of the rejection being the opposition of the Catholics to Swinton's treatment of the sale of indulgences in the time of Luther. Mr. Mead here discusses the points at issue in an impartial spirit, and with a clear perception of the merits of the case. His style is not always so clear as might be wished, and shows marks of German influence; but, on the whole, the form and temper of the work are excellent. The address begins with a rebuke to the Protestants for some of the foolish things they have said during the late dispute, and intimates that their religion is not so decidedly superior to the Catholic as they are apt to suppose. But on the actual question at issue he takes strong ground against the Catholics, intimating pretty plainly that they opposed the use of Swinton's work for the sole reason that it tells the truth about the abuses once prevailing in their church. He condemns the parochial schools, and indeed private schools generally, holding that all American citizens ought to send their children to the schools maintained by the State. He then goes on to quote from certain Catholic school-books, showing how false to historical truth they are, not so much from actual misstatement as because of omissions, evasions, and exaggerated representations of what Catholics have done for the good of the world. To all persons interested in the questions at issue, and who realize the importance of correct teaching, the pamphlet will be of interest.

AMONG THE PUBLISHERS.

SOME of our readers may be interested in the second and third numbers of the new series of publications by the American Statistical Association. The former, by E. R. L. Gould, is on the subject of "Park Areas and Open Spaces in American and European Cities." Tables are given showing the number of open spaces in all the leading cities, with the amount of space and other items of interest. The author points out the importance of having many small breathing-spaces scattered about the city, especially in the quarters inhabited by the working-classes, and shows that many of our principal towns are deficient in this respect. It appears that some manufacturing cities have sadly failed of their duty, Pittsburgh having only one and a third acres of open space, and Scranton and some other towns none at all. Mr. Gould's general conclusion is, that the policy of American cities in this important matter has been very defective. The other paper is by Edward Clark Lunt, and is a "Key to the Publications of the United States Census." It gives a brief history of the taking of the various censuses, and then presents an epitome, or analysis, of all the census publications from 1790 to 1887. The different subjects dealt with in the census, such as population, races, agriculture, and so on, are treated separately; and under each head reference is made to the volume and page of each census report which gives information upon it. The United States census is so complicated a thing, and yet so important, that such help as Mr. Lunt gives must be of service to students of statistics.

— Professor Cleveland Abbe's "Treatise on Meteorological Apparatus and Methods" forms the second part of the "Annual Report of the Chief Signal Officer for the Year 1887," which has just been published. This admirable work is a handbook equal in value to Ferrel's theoretical meteorology and Hann's and Woeikof's cli-

matology, and supplements these works in a field in which a comprehensive and exhaustive guide to the student was most sorely needed. The plan of the book may be learned from the following passage of the preface: "A uniform thought has guided the arrangement of the chapters on the different instruments: namely, there is first given a general description of the object to be attained; second, a development of the formulæ for correcting the errors of the apparatus; and, finally, an indication of the refined methods of making standard determinations, to which all ordinary practical methods are to be considered as approximations." The volume treats of the measurements of atmospheric temperature and pressure, of the motion of the air, the measurement of aqueous vapor and of precipitation, while the subjects of optics, electricity, and actinometry remain to be presented in a subsequent volume.

— The lively discussion of the question of the influence of forests as regulators of rainfall and river-flow cannot fail to have a beneficial effect. Since the interesting discussion between Professor Fernow and Mr. Gannett which was published in a recent number of *Science* (xii. p. 242), Professor George F. Swain has given a comprehensive review of the subject in the *American Meteorological Journal*. The principal advance made in this investigation is the clearer understanding of the complexity of the phenomenon, and of the fact that the influence of forests cannot be the same in different climates, on plains, and on mountains, and that it depends on the genera and species composing the forest and on the covering of the ground in forests. While most American scientists hold that forests do not increase evaporation, Ebermayer and Woeikof claim the reverse. The latter even believes that this increase of evaporation is sufficient to effect an increase of cloudiness, and a consequent lowering of the temperature of summer. The only result that has so far been generally accepted is, that forests are regulators of the flow of rivers, on plains as well as in mountainous regions. This effect alone, setting aside the value of the wood, makes their protection of great economic importance.

— The number of the *American Journal of Psychology* just issued begins its second volume. The original articles that the first volume has contained demonstrate the profit of working the American psychological field, while the copious abstracts of current literature show both the activity of investigation elsewhere and the need of such a review as this department of the journal furnishes. The first article in the present number is on "Personal Equation," by E. C. Sanford, Ph.D. Astronomical methods early brought to light the vagaries of the human factor in observation, and since Bessel's discovery of personal equation the subject has received, at one time and another, the attention of many of the most distinguished astronomers. Their studies gave the impulse to the time-measurements in psychology that have been carried on with so much success by Wundt and others. Activity has also continued among the astronomers, and this paper is an attempt to turn to psychological account the results of their analysis and experimentation, and to bring together the results reached by both sorts of investigators. The history of personal equation (beginning with the notice of a difference in the observations of Maskelyne and Kinnebrook), and of the methods from time to time applied for measuring or avoiding it, makes an interesting episode in the history of science. In a second article the author proposes to treat the variations of personal equation, and discuss the theories of its origin. The second paper is the first section of an historical and experimental study of memory, by W. H. Burnham, Ph.D. The growth of the psychology of memory is traced from the earliest Greeks to Kant. In Plato are found the beginnings of that transcendental view of memory that make it a function of the soul independent of the body. The Neo-Platonists St. Augustine and Leibnitz, neglecting individual variations, are of this party. Aristotle, on the other hand, who wrote a monograph on memory and developed the doctrine of association, is the father of Aquinas, Hobbes, Condillac, Bonnet, Hartley, and all those that see in memory only the traces of former sensations whose basis is in the end physiological. The special views of these and other philosophers, and their contributions to the theory of memory, are briefly stated by the author, as a basis, we suppose, for the presentation of modern views and the experimental treatment. It is true, that, while physiology and biology can now de-

clare that memory is in their field as well as in that of psychology, the germs of modern theories are to be found among the writings considered by Dr. Burnham. The practical side of memory receives attention in a short section on mnemonic systems. Dr. Mary Putnam-Jacobi contributes a paper on "The Place for the Study of Language in a Curriculum of Education." The first section attacks this much-debated question from a new standpoint; namely, that of cerebral physiology. The relations of language and cortical excitation are expounded at length, and the conclusion reached "that speech implies a more extensive excitation of the brain than does any action performed without speech." The acquisition of language in general has a distinct educating effect: it cultivates abstraction, and generally prepares the mind for its work. The acquisition of foreign languages in addition to the mother-tongue further complicates, extends, and refines the cerebro-mental processes. A comparison of mathematics and language shows the former to be valuable for constructing the syllogism, the latter for establishing the premises; in other words, for the details of every-day life. Between the study of things (that is, physical science) and language there is no antagonism. Language, properly studied, is rather a propædæutic to science. Between the time when the child is busy in collecting the sense-images of common things, and the time when he can return to them prepared for a genuine scientific study of them, is the period in which he should devote himself to language; not in the rote fashion, of course, but by a graded study, in which the scientific faculties of observation and induction are exercised on materials more accessible and more comprehensible than those of the distinctive sciences. By the age of sixteen the most of this work should be completed and out of the way; and, though language-study is not then to be entirely given up, the field will be free for other disciplines. The last part of the paper is devoted to practical suggestions for this kind of language-teaching. The reviews of psychological literature are, as before, one of the most important features of the journal. Nowhere else in English is it possible to secure such a conspectus of what is doing in the fields from which the new psychology draws its materials.

— On and after Jan. 1, 1889, the publication office of the Leonard Scott Publication Company will be transferred from Philadelphia to New York City, and the *Nineteenth Century*, the *Contemporary Review*, the *Fortnightly Review*, the *Westminster Review*, the *Edinburgh Review*, the *Quarterly Review*, the *Scottish Review*, *Blackwood's Magazine*, *American Naturalist*, and *Shakespeareana* will hereafter be issued from New York City. This change has been made to insure an earlier issue of these periodicals by the greater facilities thus secured for the importation of original sheets.

— The opening essay in the *Quarterly Journal of Economics* is by E. B. Andrews, on the subject of "Trusts according to Official Investigation." The facts presented are taken from reports of legislative committees and other governmental authorities, the object of the writer being to show what these organizations really are. Some difficulty was found by the investigating committees in getting at the exact truth on certain points, owing to the unwillingness of the witnesses to reveal it; but in the main the organization and working of trusts have been pretty clearly made known, and the leading facts relating to them are here set forth. The principal organizations dealt with are the Standard Oil Trust, the Sugar Trust, the Cottonseed-Oil Trust, and the Whiskey Trust; and on all of these Mr. Andrews's paper conveys a large amount of interesting information. With regard to the economic influence of trusts, the writer expresses himself guardedly; but he evidently thinks that they need watching. Professor Hadley discusses the subject of "Railroad Business under the Interstate Commerce Act," and shows that since the act went into operation the value of railroad property has depreciated twenty per cent. This he attributes to the prohibition of pooling, which prevents the maintenance of paying rates by the agreement between the companies; and he believes that a change in this provision of the law will eventually have to be made. Besides these two leading papers, the journal contains one by F. Y. Edgeworth on the question of whether gold has risen in value in recent years, on which, however, he reaches no definite conclusion. Mr. Simon N. Patten also has a

paper on "The Fundamental Idea of Capital," holding that capital is "every thing on which, labor being expended before the produce is wanted, the return will be increased beyond what it would be if the same labor had been exerted contemporaneously." The paper is of a rambling character, and the author's view is not presented with clearness. The journal contains the usual variety of miscellaneous matter, and closes with the first part of a paper on "Italian Finance," by A. B. Houghton, comment on which may be deferred till the appearance of the remainder.

— *The Open Court* for last week contains two articles upon the life and work of the late Mr. Courtlandt Palmer, the founder of the Nineteenth Century Club of New York City, entitled "The Universal Faith, an Address upon Mr. Courtlandt Palmer," by T. B. Wakeman; and "The Founder of the Nineteenth Century Club," by Moncure D. Conway. Professor Georg von Gizycki of Berlin, Germany, has two articles in *The Open Court* of Dec. 27 and Jan. 3, entitled "Death and Life," and "The Conservation of Energy in the Moral World."

— Mr. Daniel Greenleaf Thompson, the new president of the Nineteenth Century Club, and author of "The Problem of Evil," is about to publish an inquiry into the fundamental principles of social ethics and a discussion of the trend of social evolution. "Social Progress" is the title of his book, which will be issued shortly by Longmans, Green, & Co., both in London and New York. Mr. Thompson concludes by declaring his belief that social progress can be attained only through the perfection of social liberty.

— The first number (January) of the *Cumberland Presbyterian Review*—a quarterly magazine, devoted to theology, and the discussion of current religious, literary, and scientific topics, and questions connected with church-work and moral reforms, with J. M. Howard, D.D., as editor, and D. M. Harris, D.D., M. B. De Witt, D.D., and W. J. Darby, D.D., as associate editors—contains "Physical Basis of Moral Life," by President A. B. Miller of Waynesburg College; "The Family of God," by the Rev. W. H. Black, St. Louis, Mo.; "The Mosaic Doctrines of Death and After-Death," by Professor R. V. Foster of Cumberland University; "Preaching without Notes," by Rev. W. S. Danley, Lincoln, Ill.; "Charles Darwin," by Professor J. I. D. Hinds of Cumberland University; "The Pastor Getting Hold and Holding On," by the Rev. W. J. Darby, Evansville, Ind.; "The Philosophy of Missions," by Rev. D. E. Bushnell, Waynesburg, Penn.; "Our Senses: How We Use Them, and What They Tell Us," by John J. Tigert of Vanderbilt University; "The Decay of Christian Citizenship," by T. M. Hurst, Nashville, Tenn.; "Spirituality in the Church," by the Rev. P. Margeson, Marshall, Mo.; and "The Bible and Utility," by the Rev. J. D. Gold, Waukon, Io.; besides editorials, notes, and reviews of books. Single copies, per year, \$2.50; in clubs of five or more, \$2. Subscriptions should be sent to John D. Wilson, agent, 331 Church Street, Nashville, Tenn.

— Cassell & Co. will publish at once the fourteenth and concluding volume of the "Encyclopædic Dictionary." This work has been in preparation for nearly seventeen years, and extends to no less than 5,629 pages.

— D. Appleton & Co. publish a translation of Karl Marx's important work on "Capital," edited by Frederick Engels; also, in their Town and Country Library, "A Fair Emigrant," a story by Rosa Mulholland. Hereafter the volumes in this library will be put up in a neat cloth binding at 75 cents per volume.

— D. C. Heath & Co. publish for school use "Selected Poems of Wordsworth," collected and edited by A. J. George. The volume will contain lyrics, sonnets, odes, and narrative poems such as are requisite for a thorough understanding of the genius of the great poet. With the exception of the sonnets, which are grouped according to subjects, they will be arranged in chronological order. In the matter of annotation, only such material will be furnished as the pupil would not be likely to find elsewhere.

— *The Publishers' Weekly* states that A. D. F. Randolph & Co. have issued an edition of "The Thumb Bible," by John Taylor (born in 1580, died in 1654), commonly called the "Water-Poet."

Taylor, after fulfilling his apprenticeship to a waterman, seems to have served in the fleet under the Earl of Essex. Afterward he took up the trade of a waterman, and for a time was an excise collector. He was not really a poet, although he could string rhymes together with facility. At the approach of the civil war, he retired to Oxford, and was a publican. His sympathies were wholly with the Royalists; and when the town surrendered, he returned to London, and there kept a public-house. Here he died. He published "Verbum Sempereternum" (an epitome of the Old Testament in verse), dedicated to Charles I.; "Salvator Mundi" (an epitome of the New Testament in verse). These two were published in one volume in 1693, and dedicated to the Duke of Gloucester, etc., under the title of "Verbum Sempiternum," being an epitome of the Bible, termed from its size "The Thumb Bible." It was reprinted in 1849 by Longman & Co., London, and again during the present year by Hodder & Stoughton.

— D. Appleton & Co. have now ready the first volume of "An Illustrated Encyclopædic Medical Dictionary," to be completed in four volumes, compiled under the direction of Dr. Frank P. Foster, editor of the *New York Medical Journal*, with the collaboration of a dozen of the leading physicians of America. It is to be a dictionary of technical terms used by writers on medicine, physics, botany, chemistry, zoology, and other collateral sciences in the Latin, English, French, and German languages. Accuracy, convenience of arrangement, and comprehensiveness are guaranteed by the practical scholars in charge of this herculean undertaking.

— "The literary executor of Theodore Parker," says the *Boston Transcript*, "is preparing a new edition of his 'Historic Americans,' in which there will be added to Franklin, Washington, John Adams, and Jefferson, Parker's sketches of John Quincy Adams, Dr. Channing, and Webster. The volume will be twice as large as that edited by Octavius B. Frothingham, in 1870, and will contain a larger introduction and more frequent notes. Each biography will be short, not running beyond seventy-five pages, and these will contain the verdict of Parker on the life, character, and results of all of these great Americans, whose career covers the period from 1740 to 1850, or more than a century. The volume will be followed next summer by Parker's autobiography, — a work essentially new, though made up largely from materials published by himself and others from 1850 to 1875. Many passages from the diary and letters will be given, however, which have never been published, relating to Parker's acquaintance with Alcott, Emerson, Margaret Fuller, Bettine Brentano, Garrison, Wendell Phillips, and other contemporaries."

— Sampson Low & Co. have in preparation "A History of English Bookselling," by William Roberts.

— A work to be issued by the Cambridge University Press is "The Literary Remains of Albrecht Dürer," by W. M. Conway. The volume will contain transcripts from the British Museum manuscripts, and it will be illustrated.

— "The Villon Society," says the *Academy*, "will shortly issue an addendum to their edition of 'The Thousand Nights and One Night.' The new volume will contain the stories of Aladdin and Zeyn el Asnam, translated from the newly discovered Arabic text by Mr. John Payne."

— The Geographical Society of St. Petersburg has just issued a superb edition of the last work of Gen. Prjevalsky, entitled "From Kiakhta to the Sources of the Yellow River," an exploration of northern Thibet and the route across the basin of Tarim by Lob Nor. The book gives portraits of the author and his companions, and many maps and illustrations. Like all work done by this lamented author, it is exhaustive and scholarly, and a convincing proof that the untimely death of the writer is a great loss to Russian science.

— The readers of *The Popular Science Monthly* will be glad to learn that Dr. Andrew D. White's "New Chapters in the Warfare of Science" are to be resumed in the February number. Dr. White has devoted several years to the investigation of this subject, and is now in Europe making an examination of the libraries there for additional material, which shall enable him to continue his ac-

count of the persistent dominance of delusion in the human mind. The chapter immediately forthcoming will treat of "Demoniac Possession and Insanity."

— The way the Interstate Commerce Law looks from the side of the railroads will be shown in the February *Popular Science Monthly*, by Mr. Appleton Morgan, in a vigorous article entitled "The Political Control of Railways: is it Confiscation?" Mr. Morgan maintains that this act, by prohibiting pools, nullifies its other prohibition of discriminations; in fact, increases discrimination, when the whole people is regarded.

— "The Story of a School" is the title of an article by the late Professor James Johonnot, to appear in the February *Popular Science Monthly*. It is an account of the success achieved in conducting a normal school according to natural methods, arranging the subjects of study in their order of dependence, teaching science by observation, language by using language, mental and moral philosophy objectively without books, and with no marking system, rules of discipline, or distinctive religious exercises.

— *The American Queen*, a monthly magazine for the home, is published by the First National Publishing Company (John C. Rand, president), 131 Devonshire Street, Boston.

— We have received from F. W. Christern & Co. (New York) the first number of *L'Exposition de Paris de 1889*. It contains, among other things, a large bird's-eye view of the exposition grounds and buildings, pictures of the chief and assistant engineers and architects, including M. Eiffel, general and detail views of the 300-metre tower now being erected by the latter gentleman, and a prospectus of the exposition. Forty numbers of the publication will be issued during the progress of the exposition, at ten cents a copy.

— An extra December number of the Riverside Literature Series (Houghton, Mifflin, & Co.) is devoted to "Dialogues and Scenes from the Writings of Harriet Beecher Stowe," arranged for reading-exercises and dramatic representation, by Emily Weaver. Care has been taken to adhere to the original text as closely as possible; and, to make the dialogue clear and to explain the action, explanatory passages from the books in which the dialogue occurs are added from time to time. The dialogues are taken from "Uncle Tom's Cabin," "Old Town Folks," and "The Minister's Wooing."

— In a copiously illustrated article in *Frank Leslie's Illustrated Monthly* for January, Lieut. F. S. Bassett, U.S.N., traces the evolution of the rudder, from the primitive paddle with which the savage both propels and guides his dug-out or birch-bark canoe, to the modern steam or hydraulic steering-gear of the great ocean steamships. The illustrations, which are drawn from early monuments and coins, and mediæval frescos and paintings, show the change in method of steering, from that in which the blade of the oar or paddle is moved bodily through the water in a nearly horizontal plane, to that in which the vertically placed successor to the oar-blade, the rudder, is merely turned upon its axis. An interesting fact mentioned in the article is that one of the most recent improvements in steering apparatus is a reversion, on a higher plane, to the most primitive method, a swinging propellor both driving and guiding the vessel, as did the paddle in the hands of the savage. An article somewhat similar in nature to that of Lieut. Bassett's, though more limited in scope, is published as a supplement to *Harper's Weekly* of Jan. 5. It is entitled "The Evolution of the Ferry-Boat," and is from the pen of S. Bayard Dod. Though dealing only with the ferries and ferry-boats of New York, it contains much to interest the general reader. Beginning with the first licensed ferry on the North River, that between New York and Communipaw, in 1661, when the fare was "six stuivers a head Wampum for every passenger," and the boat was propelled by oars or sails, Mr. Dod follows the growth of the ferries down to the "horse" stage, when the boats were propelled by paddle-wheels actuated by horse-power, and then to the introduction and development of steam ferry-boats, ending with a description of the latest triumph of ferry-boat architecture, the "Bergen,"—a steel boat, with fifteen water-tight compartments, and a propellor at either end, to take the place of the paddle-wheels which have prevailed heretofore in such boats. Either a slip of the

pen or a printer's error makes Mr. Dod say that the walking-beam low-pressure engines in general use "have gradually increased in size, from 25-feet diameter of cylinder with 5-feet stroke, to 46 and 50 inch cylinder with 10-feet stroke."

— Professor J. H. Gore of the Columbian University has in preparation a bibliography of geodesy. During two trips to Europe he has collected about seven thousand titles, having examined nearly every large library except that at St. Petersburg. He begins with the first effort to ascertain the shape of the earth by triangulation in the seventeenth century. The work will be published soon by the Coast Survey. Professor Gore is trying to make his service complete by personal application for data, he having written to all astronomers and other mathematicians in the world whose addresses he could obtain. He asks *Science* to say that the co-operation of its readers is desired.

— Dr. C. A. White has just prepared a bulletin for the Geological Survey, on "The Permian of Texas," adducing some facts not hitherto published, in recognition of the Permian in North America, and exhibiting some fossil forms not hitherto known to exist on this continent, and a commingling of paleozoic and mesozoic types similar to those discovered by Waagen in the Salt Range of India.

— The *London Globe* of Dec. 4 describes a new plan for the lending of books. The circulating library is now an important element in English life, and, widely spread as are its ramifications, it is possible seemingly to extend them even further. The experiment, at any rate, is to be made in Austria-Hungary and on the railways there. In England Messrs. Smith & Sons have a circulating library in connection with their book-stalls, but they do not lend books for perusal on the journey only, charging a fee and taking the volumes back again at "the other end." Yet this is precisely what the Austrian firm propose to do. The traveller will be required to pay a deposit which shall cover the price of the book lent, and also a small charge, amounting to about threepence in English money. He will choose a volume on starting, and return it on arrival at his destination, where he will receive the sum deposited. No doubt the project will succeed, if the supply of books is found satisfactory by the voyager.

— From the *Pall Mall Gazette* we learn that Miss von Hoerschelmann's two-volume "Kulturgeschichtlicher Cicerone für Italien-Reisende" has had the rare distinction in Germany of being by special permission dedicated to the Empress Frederick, before whom and the Emperor the lady has repeatedly lectured. Like every thing else in Germany, the dedication of a literary work to a member of the imperial family is connected with an incredible amount of red tape. There is a codex in the laws relating to the imperial household according to which no scientific work may be dedicated to any member of the imperial family unless it comes up to a certain standard. A number of *savants* "sit upon" each work of this kind, and determine whether the dedication is to be or not to be. One of the conditions is that the work shall contain views or discoveries hitherto not dealt with. Miss von Hoerschelmann's Cicerone could naturally not lay claim to this distinction, and it was owing to a special interference of the Empress Frederick that her two volumes passed the censor and were dedicated to her Majesty.

— The Aldine Book Publishing Company state that they have sold nearly 10,000 copies of their "Europe Illustrated."

— The Library Bureau, Boston, announces to subscribers to the "Decimal Classification," that, after many unforeseen delays, the complete tables and index of 20,000 entries was printed last month, and will be in from the bindery this week. The regular edition, containing the introduction, cannot be had from the bindery till after the holidays, possibly by Jan. 30. Those in special haste may obtain now the tables and index bound, and in January the introduction in pamphlet form.

— According to *The Publishers' Weekly*, Col. Wright, the commissioner of labor, expects to send two volumes to Congress before the present session closes. The first will be the fourth annual report of the Labor Bureau, and will be devoted to the working-women in the great cities. The other volume will be the report

on divorces and divorce laws, for which a special appropriation was made by Congress. The records of 2,700 courts have been examined; and the volume will give, in classified form, the number of divorces, with causes, number of children, when divorced, and other accessible information. The agents of the Department of Labor are now at work on the fifth annual report, which will not be ready for a year yet, on the wages of railroad-men.

—“Mr. B. F. Stevens, 4 Trafalgar Square, London, has been for some years at work on indexes to the manuscripts relating to American affairs between 1763 and 1783 preserved in European archives. The United States Government urged the purchase of these indexes, and also the obtaining of transcripts of the documents themselves. Congress has, however, made no grant for the purpose, and Mr. Stevens therefore boldly proposes to publish photographic facsimiles of the documents, provided he can obtain a hundred subscribers to begin with. Each document will be accompanied by a statement of its *provenance*, and of any variations to be found in other copies, if such exist; and a translation will be added when the original is not in English. Mr. Stevens calculates that when he has once fairly started he will be able to publish monthly two volumes of some 500 pages each, and he asks \$100 for every five volumes. A copious index will be published to every twenty-four volumes, and the price of it will be \$20. Mr. Stevens thinks that this valuable series of facsimiles will ultimately fill 100 volumes.”

—Columbian University has announced a unique course of lectures for the coming months, on “The Human Emotions from an Anthropological and Psychological Point of View.”

—At the meeting of the Philosophical Society on Jan. 5, obituary notices were made of Peter Parker, E. B. Elliott, F. V. Hayden, Roland D. Irving, Thomas Hampson, and Emil Bessels; and Mr. Bailey Willis read a paper on “The Mechanism of the Overthrust Fault.”

LETTERS TO THE EDITOR.

* * *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

Two Discoveries in Human Osteology by the Hemenway Expedition.

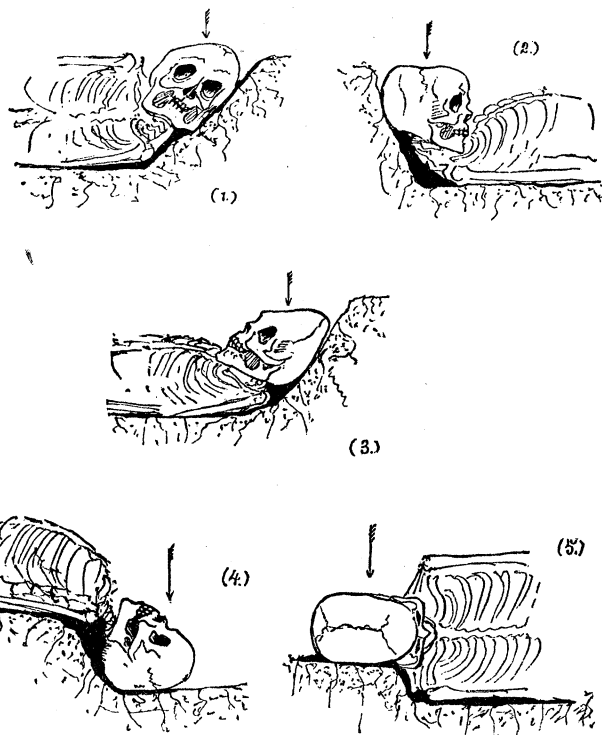
I HAVE the honor of enclosing to you a letter handed me by my friend Professor Edward S. Morse, who deems the matter therein discussed by Mr. Cushing of such importance as to merit prompt announcement in your journal.

First, however, I will ask leave to mention briefly another important discovery made during the researches of the Hemenway Expedition in the Salado and Gila valleys in southern Arizona last winter and spring. In the summer of 1887 Mr. Cushing, the director of the expedition, was dangerously ill at Camp Hemenway, on the site of the prehistoric city of Los Muertos. Through the kindness of Secretary Endicott and Surgeon J. S. Billings (the director of the Army Medical Museum at Washington), Surgeon Washington Matthews (the curator of the museum and an intimate friend of Mr. Cushing) was ordered to Arizona to his relief and assistance. Dr. Matthews, whose arrival at Camp Hemenway was just in time to save Mr. Cushing's life, was so much impressed with the character of the ancient skeletons there exhumed, that, as an anthropologist, he perceived that it would be of immense scientific value to have them preserved in the most careful manner possible. On his return to Washington, he represented the matter to Dr. Billings, who at once detailed Dr. J. L. Wortman, the talented comparative anatomist of the museum, to assist the expedition in properly exhuming and preserving the skeletons. It is a notable fact, that, with few exceptions, the skeletons in the various museums of the world have been carelessly collected, and are therefore worthless in the study of certain features: therefore the importance of having this work proceed under the supervision of two such men as Drs. Wortman and ten Kate, the latter the anthropologist of the expedition, may be perceived. Fortunately the expedition had also three or four Mexican workmen of such native intelligence, that, under the training of the two doctors, they became highly expert in the recovery of the skeletons, complete in every detail; the great

age of the remains rendering them very fragile, and demanding, therefore, extremely careful manipulation.

Early in the course of the work, Dr. Wortman observed indications of a remarkable anatomical peculiarity in the remains. Calling the attention of Dr. ten Kate to the fact, together the two pursued the investigation of the same, and all subsequent observations thoroughly confirmed their first inference. This fact was, that in this race the hyoid arch, or basi-hyoid, which together with the stylo-hyoid forms the bony structure at the base of the tongue, was not in the adult co-ossified, the three small bones forming the arch remaining free through life; the only exception being in the case of skeletons bearing marks of bone-disease, exhibited in the co-ossification of various articulations, in which cases the bones of the basi-hyoid were apt to be ankylosed, though occasionally on one side only. The strongest evidence was that exhibited by the skeletons of old persons, which proved no exception to the general rule of this observation.

This peculiarity was contrary to all the former experience and studies of the two observers, and it indicated the discovery of a pronounced racial character; for, according to what they had hitherto learned concerning this feature, the ankylosis of the basi-hyoid took place either at or before middle life.



Consulting the literature of the subject, it was found that both the English and French anatomical authorities concurred in this view, while the German authorities held that the several bones of the arch remained free, ankylosis taking place only exceptionally or in extreme age. It was inferred that the German view was either based upon insufficient evidence, the conclusion being drawn perhaps only from the anatomy of young persons, or that the anatomy of the German race differed in this respect from that of the English and French.

These observations were embodied in a brief preliminary paper by Drs. Wortman and ten Kate, and communicated to the International Congress of Americanists held in Berlin last October, at which Professor Morse and I had the honor of representing the Hemenway Expedition. The paper was read to the congress by Professor Morse, who illustrated it with blackboard-drawings. The subject occasioned much interest, for it was felt that it would prove to be of extreme importance should it turn out to be a peculiar feature of the aboriginal race of the American continent, as was indicated. Subsequent examinations of a large number of skeletons exhumed from ancient ruins during the excavations of the Hemenway Expedition at Zúñi, where it is now at work, have uniformly supported this view; and while we were in Berlin a Pe-

ruvian mummy was placed at the disposal of Professor Morse by Dr. Wilhelm Reiss, the learned president of the congress, and the discoverer, in association with Dr. Stübel, of the famous Ancon antiquities. An examination of this mummy, which was that of an elderly person, showed that the elements of the hyoid arch were free.

When the attention of Professor Virchow was called to the subject by Professor Morse, that eminent anatomist said that the question had apparently been entirely neglected. He was inclined, however, to support the correctness of the view advanced by the German authorities, and regard the co-ossification of the hyoid arch as occurring only under abnormal or pathological conditions.

Returning home by way of London, while visiting the British Museum of Natural History, we had the good fortune to meet the eminent mammalogist, Professor Flower. When we called his attention to the subject, he expressed the liveliest interest, saying that the observation was entirely new, the separation of the bones of the basi-hyoid being wholly contrary to any thing observed in his own large experience. He had taken the pains of making careful observations of this feature, and had made preparations of full sets of the *os hyoides* both in man and the lower mammalia. In man he had found that co-ossification took place at maturity, and in proof he called attention to a complete series of British hyoids which he had prepared for the College of Physicians and Surgeons. Therefore he would regard this observation of Drs. Wortman and ten Kate as indicating a very important discovery. The collection of human hyoids at the College of Physicians and Surgeons was inspected by Professor Morse, who found it prepared with the skill and knowledge for which Professor Flower is famous. Every specimen, when after maturity, was co-ossified.

Under a co-operative agreement made at the time between the Army Medical Museum and the Hemenway Expedition, the skeletons exhumed from the ancient cities in southern Arizona have been deposited with the former institution; and Dr. Billings is so impressed with the importance of the question, that Drs. Matthews and Wortman have been requested to make it the subject of an exhaustive research. In this work they, with their assistants, are now engaged, and have been supplied with an abundance of material from various races, in order to make the needed comparative observations. A full report thereon will be forthcoming in due time, but it may already be stated that the investigations have been advanced to a stage that fully confirms the opinion originally formed by the observers, — that in the peculiarities of the *os hyoides* is to be found the most distinctive racial character yet observed in human osseous anatomy. Its value in the determination of vexed questions can hardly yet be estimated, but it will undoubtedly prove of great anthropological service.

Dr. Wortman inclines to the view that it will be found that language plays a leading part in determining the form of this feature. The language of the American Indians is such that it requires but slight effort in utterance. An Indian can talk for hours at a stretch with little fatigue, and even a superficial observer will notice the restrained quality of the voice, the tones not being projected as with us. Now, the development of ankylosis being held to proceed from exercise, or irritation of the bone, from muscular action or otherwise, it is evident that in a language like that of the Indians there would be less muscular action exerted upon the hyoid arch than in one like ours, where more force is used, and therefore the co-ossification of the parts would be less encouraged. This view of Dr. Wortman's obtains support in observations made by Mr. Cushing at Zúñi, where he finds that the voices of those who are afflicted with bone-disease differ in quality from those of the tribe at large, and infers that their difference may be due to co-ossification of the hyoid brought about by the disease.

With the foregoing remarks, I hereby submit Mr. Cushing's letter concerning the other important osteological observation mentioned in the beginning.

SYLVESTER BAXTER,
Sec'y Hemenway Expedition.

OLD FARM, MILTON, MASS.,
Nov. 9, 1888.

My dear Morse, — Last evening I chanced to tell Mrs. Hemenway something about the observations we made on the distorted skulls of

Los Muertos and Halonawan. She was greatly interested, especially in what Baxter had to say relative to Dr. Virchow's paper before the recent congress, on, I think, deformed American crania. She wished me to write a brief statement of the case and send it to you, as of possible use to Drs. Virchow and Bastian.

While our excavations were in progress, I observed, by keeping close watch over the disinterments, that all, or nearly all, skulls occurring in earth sepulchres, were apparently deformed by artificial means. From the fact, however, that skulls taken from stone graves or cists, or from other sorts of tombs wherein they had been fairly protected, were uniformly and regularly brachycephalic, and showed no other sign of distortion than the occipital flattening from the cradle-board, I was led to infer that those from the earth sepulchres had been deformed by accident; that is, by post-mortem influences.

Subsequent observations, in all of which I was confirmed by Dr. ten Kate, indicated the entire correctness of this inference. For example: no general rule of cranial disfiguration (always with the above instanced exception) was found to prevail. On the contrary, the disfigurations seemed to depend largely, if not wholly, on the positions of the skulls. When the latter were lying on their sides in the graves, at an angle of, say, forty-five degrees, one side of the coronal region would be depressed, and sometimes the face, even, would be obliquely distorted, as in Fig. 1 of the accompanying slips. Again, when the skeleton was lying on its back, with head elevated, the crown would be greatly depressed, as in Fig. 2; or, if the head happened to be less elevated, face partially upturned, the frontal region was invariably more or less flattened and broadened, as in Fig. 3; or if, finally, the head chanced (face still upward) to be greatly depressed, the parietal region was flattened, throwing the frontal forward sometimes to an extraordinary degree, as in Fig. 4.

Perhaps the most extreme of these cases of post-mortem distortions of skulls were those which, belonging to skeletons of persons who had been buried on their sides, were so regularly flattened laterally that they seemed unmistakably to belong to the dolichocephalic class, as in Fig. 5. In fact, the only examples of "long-headed" skulls found during our researches, in either the north or the south (among the ancient ruins, that is), were so plainly distorted by this post-mortem pressure, that they made no exception to the rule established by Dr. ten Kate, that the Pueblo or Aridian was a short-headed race.

All this is simply due to the practice of blanket-burial. The skulls, being unprotected during the earlier years of burial, are, by the pressure of the earth, gradually deformed, — so gradually, indeed, that they neither crack, nor do the sutures part. The deformities are therefore in no wise distinguishable, after the specimen is removed from its original resting-place, from those produced by art. We are now, therefore, forced to note, in collecting our crania, their relative positions in the earth sepulchres very carefully.

I sincerely hope this may prove useful to Drs. Bastian and Virchow, or at least of some interest to them and the many other gentlemen who were so courteous to you and Mr. Baxter.

Faithfully yours,
FRANK HAMILTON CUSHING.

The Julien Electric Traction System.

IN the opening pages of your journal of Dec. 21, 1888, a description is given of the Hauss Electric Railway, and comparisons are made between that system and other systems of electric traction. A paragraph is devoted to pointing out what the writer claims to be the defects of the storage-battery system.

It is very much to be deplored that some electrical railway companies attempt to raise their own systems in the public estimation by crying down other systems. What is still more deplorable is, that, in attempting to do this, they are not always friends to truth. There could be no better proof of this than the paragraph I have above referred to on the storage-battery system.

The writer admits that the storage-battery plan "would seem to be the ideal system," for the reason, among others, that "it dispenses with the necessity of a continuous conductor, the electrical generator and motive power are all contained within the car, and there is apparently an entire absence of any possibility of danger to the passengers." The writer goes on to say that "these favorable anticipations would be justified were it once demonstrated that a storage-battery had been devised that was economical of power, of reasonable weight, and durable in service." The writer

then goes on to say that "the best storage-battery that has been devised is very wasteful as a source of motive power, yielding at most but forty per cent of the power applied." Now, nothing could be further from the truth than this statement. There is probably not a storage-battery at present on the market that will not yield eighty per cent of the power applied. Almost any person of electrical knowledge and experience knows this to be a fact; and, if further proof be necessary, it will afford me much pleasure to have you send an expert, at my expense, to the electric station of the Julien Electric Traction Company, 85th Street and Madison Avenue, this city, to verify for himself the truth of this statement. He can there see for himself the number of watts the battery receives from the dynamo; and, if the battery does not discharge over eighty per cent of the watts so received, you are welcome to publish the fact to the world.

The next objection the writer raises to the storage-battery system is, that it is "excessively heavy and bulky, making it necessary to carry about three times the load of an ordinary car." Now, "the load of an ordinary car" (16-foot car) is 3 tons: consequently a storage-battery car would have to carry 9 tons of battery, if we are to believe the writer. Now, Car No. 3 of the Julien Electric Traction Company, at present running on Fourth and Madison Avenues in this city, carries just 120 elements, or cells, of battery, each element weighing exactly 27 pounds, or 3,240 pounds; or, with the trays and containing-boxes, 3,600 pounds, — a little over $1\frac{1}{2}$ tons, instead of 9 tons, as the writer would have us believe. Let me add, in connection with the weight of a storage-battery car, what every engineer knows, that in a locomotive (which the storage-battery car is), to have adhesion, you must have weight.

The 120 cells above referred to contain 52 horse-power hours, and will carry that car over the streets of New York, without being recharged, for a distance of at least thirty-six miles, and carrying over four hundred passengers in all. If the Hauss Electric Railway is now doing equally acceptable and economical work, it would be very interesting for the public to know it. The writer omitted, by the way, to state where the Hauss electric system may be seen, and what practical experience, if any, it has had.

The writer goes on to say that the storage-battery system requires a special car to be built, to provide the necessary space beneath the seats to receive the battery. This is equally untrue. Car No. 3, above referred to, is an old horse-car, and was altered at an expense of about two hundred and fifty dollars for its present purpose. The alteration required is the lifting of the car-body some five inches above its present position.

The next objection the writer has to the storage-battery is, that it "has a life of only two years of constant service, and it is subject to the danger of short-circuiting, which at once destroys its usefulness." The remark as to short-circuiting is very amusing. Am I to understand that the motors constructed by the Hauss Electric Railway (if they do actually construct any) are not subject to the danger of short-circuiting? If so, we must assume that their usefulness is destroyed. Now, we all know that the experience of every electric railway in the country is that the electric-railway motor has the same tendency to short-circuit that the most peevish mule has to kick. If the short-circuited motors of 1888 were made a pile of, we should not need to go to Egypt to see a pyramid. The fact is, that, since the fifteenth day of September last, up to the present moment, we have not short-circuited a battery in our street-car service, although our cars have run in that time in passenger-service some seven thousand miles. This storage-battery short-circuiting is a thing of the past. The cells are at present so connected that short-circuiting is impossible; for the connector would be blown out of position by an excessive current, and thus save the battery. We should be pleased to have you verify this at our station in this city. The writer gives our battery "only two years of constant service." We thank him for that concession, for we only ask six months' constant service in order to compete with the cost of horse-traction. He probably forgets that the material in the battery is not destroyed when the "usefulness" of the battery ends, but is again made over into battery by a process so cheap as to compete favorably with the maintenance of horses.

One word more, Mr. Editor, and I have done. Our 18-foot cars,

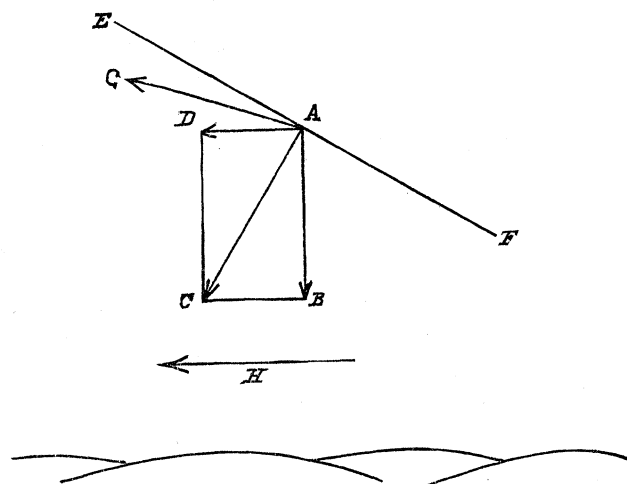
Nos. 1 and 2, now in the service of the Fourth and Madison Avenue lines, in this city, run from 86th Street and Madison Avenue to the Post-Office, and back, — a distance of twelve miles, — on an expenditure of less than fifteen horse-power hours of energy, and frequently carry over two hundred passengers on the round trip. This seems almost too good to be true; but you would do us a favor by inspecting the records at our station, and verifying this statement for yourself. With storage-battery traction there can be no mistaking the amount of energy expended; for we know the number of horse-power hours that are put into the battery, and of course the number of miles such charge will carry the car. Now, for the information of the public, we think it but fair that the Hauss Electric Railway should tell us how far fifteen electrical horse-power hours has carried one of their cars. The comparison would be very interesting.

WM. BRACKEN.

New York, Jan. 5.

The Soaring of Birds.

IN a recent number of *Science* (xii. p. 267) I notice an article under the above heading. It seems to me that we have not yet got to the bottom of the matter, and that the true explanation of the phenomenon is still simpler. Imagine a piece of paper floating in the air. The wind takes it, and carries it along horizontally with its own velocity. After it has assumed the velocity of the wind, there is but one force acting on it; namely, the vertical one due to its own weight. Imagine now a bird under the same circumstances. Instead of travelling with the wind, as everybody who has watched a



soaring bird knows, he travels round and round in circles, each one a little higher than the last, and each one a little farther along in the direction towards which the wind is blowing. Now, when he travels with the wind, he attains nearly its velocity, and then turns and travels against it, rising rapidly at the same time, till he is nearly stationary, or perhaps is even going a little backwards, relatively to the ground. He then turns and travels with the wind again, either moving along horizontally, or perhaps dropping somewhat nearer the earth, until he attains his original velocity, when the cycle is repeated. Comparing his motion with that of the paper, we find that he does not move along so fast: there must, therefore, be some compensating advantage obtained, in order to use up the surplus energy derived from the wind.

In the above figure let *H* represent the direction of the wind, and *A* the position of the bird. Let *AB* represent the force due to his weight, and *AD* the mean force exerted on him by the wind, owing to the fact that he does not move along as fast as the surrounding air. Combining these, we get the resultant force *AC* acting upon the bird. Now construct the plane *EF* perpendicular to the line *AC*. The bird may then move anywhere in this plane without losing energy. He cannot move to the right of it, but he may move to the left, and thus gain energy. Practically he will move in a spiral about the line *AG*, thus slowly dropping from the plane

EF, but gaining enough energy by that means to make up for that lost by friction with the air. He will thus gradually rise from the earth, and at the same time drift along with the wind.

WM. H. PICKERING.

Harvard College Observatory, Cambridge, Jan. 1.

The Great Lake Basins of the St. Lawrence.

THE following are the conclusions of a paper under the above title to appear during January in the *Canadian Record of Science*, and the object of which is to suggest what has been the origin of the present contours of the Great Lakes:—

That glaciers, while contributing some results, had not much effect in eroding the lake-basins proper, or in shaping the present general outlines.

That the superficial deposits are the accumulations of denudation during immense periods of time since the carboniferous and earlier eras, and are not to be specially credited to the operation of glaciers.

That Lake Superior is the most ancient of the lakes, dating its origin as far back as Cambrian, Keweenawan, and Huronian times; that it is, in part at least, a synclinal trough; that volcanic action has had most to do with its origin and the shaping of its coasts; that its early outlet was through the depression in Whitefish Bay; and that its waters joined the great pre-glacial river system at or near the Straits of Mackinac.

That Lakes Michigan, Huron, and Ontario were originally the bed of a pre-glacial river which first crossed the Ontario peninsula along the Niagara escarpment, and afterwards was diverted to a course by way of Long Point, Lake Erie, and the Dundas valley; that their basins were largely defined by the elevation of the Niagara and Hudson River escarpments, and in more recent times by warping of the strata and deposit of superficial sands and clays which blocked the old river-channels and resulted in the lake-basins retaining their water on the final elevation of the land to its present general levels.

That the pre-glacial river system expanded into lakes of some size in each of the present basins of Lakes Michigan, Huron, Erie, and Ontario.

That Lakes Erie and St. Clair are the most recent of the lakes, and have at one time been more closely united; and that the formation of this united lake was due to the blocking of the old outlets both by superficial deposits and warping of the strata, and to the water being thus retained in the basin on the final elevation of the land to the levels of to-day.

That great fractures at or near the outcrops of the strata occasioned by the directions of the forces which elevated the strata, originated, in many instances, the deep bays and inlets which indent the Niagara and Hudson River escarpments, and rocky coastlines of Lakes Michigan and Huron; these effects being afterwards supplemented by the action of waves, currents, atmospheric causes, and probably local glaciers.

That since the elevation of the land to the levels of to-day, the action of waves and currents on the clay cliffs and sand deposits has in many places greatly rounded off the general outlines of the coast, and the material from this and other sources has been spread over the lakes, or has served to create new features in the coastline elsewhere.

A. T. DRUMMOND.

Montreal, December, 1888.

Color of Katy-did.

THERE has recently come into the possession of the writer a specimen of the Katy-did showing a remarkable variation in color. The whole body is of a beautiful and delicate rose-pink. The specimen, when captured, did not seem to be abnormal in any other respect. It has been identified by a member of the entomological division of the Agricultural Department as *Phylloptera oblongifolia*. It seems to be a rare variation, though from the same gentleman we learn that at least one similar case has been recorded. A specimen exactly like this one in color is mentioned by Riley in his "Sixth Report on the Insects of Missouri" as having been sent to him many years ago.

L. N. JOHNSON.

Evanston, Ill., Dec. 30.

Various Definitions of Manual Training.

AN article in *Science* of Jan. 4, under the caption of "An Authoritative Definition of Manual Training," embodies an abstract of the report of the special committee on manual training of the New Jersey Council of Education, the semi-annual meeting of which body was recently held at Trenton, N.J. The committee, in concluding its report, submitted the following resolution, which was unanimously adopted:—

Whereas there are several and conflicting uses of the term "manual training," be it hereby

Resolved that the New Jersey Council of Education defines "manual training" as "training in thought-expression by other means than gesture and verbal language, in such a carefully graded course of study as shall also provide adequate training for the judgment and the executive faculty." This training will necessarily include drawing and constructive work, but experience alone can determine by what special means this instruction may best be given.

From an educational standpoint, the definition of "manual training" formulated by the committee would appear to be indisputable; but that the definition, supported as it is by the broad pedagogic principles which underlie it, will be universally accepted as authoritative and final, is not as certain as that the definition is such as to best subserve true educational aims. At least, it is safe to say that thousands of educators and school-officers must eliminate from their minds the impression that manual training has for its object the learning of a trade or the acquisition of mechanical skill alone, ere the definition given by the committee can have free course.

Again: there are others who are unwilling to accept the *dicta* of schoolmen, and who insist upon the mere technical or industrial phase of manual training, and can see nothing beyond it. Any thing that does not centre in this is, to them, an indubitable evidence of inutility. Training of thought, of judgment, of expression, etc., as educational stimuli, do not as potent factors enter into their conception of the aim and end of manual training.

That the training of the school workshop has a reflex influence upon the traditional occupations and "studies" of the classroom, causing pupils to reflect, to compare, to be careful and exact in these also, has not thus far been taken into the estimate of the worth of manual training as generally as the facts warrant; for manual training is not that of the hand alone, but of the intellect as well.

The joint training of the mental faculties and the hands tends to dignify the labor of the latter,—the form of labor which by many is alone recognized as "work." But it does not end there: it affords at the same time opportunities for the discovery of latent inventive or mechanical genius, and, when such discovery is made, serves as a guide in the choice of employment.

One must necessarily lead an unsatisfactory and precarious existence, who, from a false estimate of the relative respectability of two or more employments, chooses that for which he has but little natural aptitude and less acquired skill. And is it not true that the popular education of the past has tended toward the making of such choices? Has it not tacitly inculcated the idea that professional employment—the law, medicine, the pulpit, or the professor's chair—is the "chief end of man" according to the creed of the schools? In numberless instances such choices have been made, with the attendant and natural result of dismal failure.

As a corrective, manual training brings to bear a species of craniology which will eventually develop a more rational creed; and this view of manual training I conceive to be entirely compatible with the definition which the committee on manual training formulated.

O. M. BRANDS.

Paterson, N.J., Jan. 7.

Color-Blindness.

A SHORT time ago I tested the color-perception of forty-two boys who had had kindergarten training. Their ages were from nine to fifteen. Not one of them made an error in matching colors. They were not asked to name them. This result suggests further investigation upon this class of pupils, not only to add one more fact to our knowledge of color-blindness, but also to determine the value of early instruction in colors.

ARTHUR STEVENS.

Jefferson, N.Y., Jan. 6.